



Julia Belyakova

Curriculum Vitae

Dec 26, 2020

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| <i>Current position</i> | PhD Student at Northeastern University (Boston, MA, USA) |
| <i>Email</i> | julbinb@gmail.com (preferred), belyakova.y@northeastern.edu |
| <i>Homepage</i> | julbinb.github.io |
| <i>Professional</i> | researchgate , github , linkedin |

RESEARCH INTERESTS

Programming languages, type theory, theorem proving, compilers, generic programming, software engineering.

EDUCATION

PhD in Computer Science 2018–present

Khoury College of Computer Sciences (Programming Research Laboratory)

Northeastern University, Boston, MA, USA

Academic/Research advisor: Professor [Jan Vitek](#)

MS in Computer Science and Information Technologies 2012–2014

I. I. Vorovich Institute of Mathematics, Mechanics and Computer Science

Southern Federal University, Rostov-on-Don, Russia

“A Model of Concepts for an Imperative Programming Language”

Academic/Research advisor: Assoc. prof. Stanislav Mikhalkovich

[\[paper \(in Russian\)\]](#) [\[slides \(in Russian\)\]](#)

BS in Computer Science and Information Technologies 2008–2012

I. I. Vorovich Institute of Mathematics, Mechanics and Computer Science

Southern Federal University, Rostov-on-Don, Russia

“Automatic Constraints Collection in a Programming Language with Generic Functions and Type Inference”

Academic/Research advisor: Assoc. prof. Stanislav Mikhalkovich

[\[paper \(in Russian\)\]](#) [\[slides \(in Russian\)\]](#)

EMPLOYMENT

Research Scientist Sep 2017–Jul 2018

Programming Languages Laboratory, Faculty of Information Technology

Czech Technical University in Prague, Prague, Czech Republic

Research Scientist Jan–Jul 2017

Programming Research Laboratory, College of Computer and Information Science

Northeastern University, Boston, MA, USA

Teaching Assistant, Lecturer 2014–2016
I. I. Vorovich Institute of Mathematics, Mechanics and Computer Science
Southern Federal University, Rostov-on-Don, Russia

Part Time Programmer 2012–2013
Laboratory Angstrom-SFEDU, Rostov-on-Don, Russia

SELECTED PROJECTS

Juliette: A Formalization of World Age and Eval in Julia 2020–present
A formalization of world age in the [Julia language](#). [World age](#) is a mechanism that enables efficient and relatively simple implementation of multiple dispatch in the presence of `eval`: with the world-age semantics, Julia can optimize methods and method calls at certain points of the program execution without the need to de-optimize them on the fly. [\[project page\]](#)

LambdaJulia: A Formalization of Subtyping in Julia 2017–present
Formal definition of subtyping in the [Julia language](#), a dynamic language for scientific computing with multiple symmetric dispatch, user-defined parametric types, union types, and existential types. [\[project page\]](#)

Concept Parameters: Language Support for Generic Programming in Object-Oriented Languages 2014–2017
Concepts (as C++0x concepts, Haskell type classes, or Java Genus constraints) encapsulate constraints on type parameters. Together with multiple models, concept parameters can provide OO languages with more expressive language mechanism of generic programming than the existing one based on F-bounded polymorphism. [\[project page\]](#)
[\[thesis proposal\]](#) [\[Coq formalization for STLC on github \(work-in-progress\)\]](#)

Web Development Environment PascalABC.NET (WDE) 2009–2013
Web development environment for programming languages: [PascalABC.NET](#), Python, C#. [\[web-page\]](#) [\[e-source registration scan \(in Russian\)\]](#) [\[project page\]](#)

PUBLICATIONS

PEER-REVIEWED CONFERENCE/JOURNAL PUBLICATIONS

1. [Julia Belyakova](#), Benjamin Chung, Jack Gelinias, Jameson Nash, Ross Tate, Jan Vitek. “World Age in Julia: Optimizing Method Dispatch in the Presence of Eval”, *Proceedings of the ACM on Programming Languages. Volume 4 Issue OOPSLA*, DOI [10.1145/3428275](#). ACM New York, 2020, p. 207:1–207:26. [\[project page\]](#) [\[video\]](#) [\[preprint\]](#)
2. Cameron Moy, [Julia Belyakova](#), Alexi Turcotte, Sara Di Bartolomeo, Cody Dunne. “Just TYPEical: Visualizing Common Function Type Signatures in R”, *2020 IEEE Visualization Conference Short Papers, OSF Preprints*, DOI [10.31219/osf.io/pyqac](#). (5 pages). [\[project page\]](#) [\[video\]](#) [\[preprint\]](#)
3. Francesco Zappa Nardelli, [Julia Belyakova](#), Artem Pelenitsyn, Benjamin Chung, Jeff Bezanson, Jan Vitek. “Julia Subtyping: A Rational Reconstruction”, *Proceedings of*

the *ACM on Programming Languages. Volume 2 Issue OOPSLA*, ISSN 2475-1421, DOI [10.1145/3276483](https://doi.org/10.1145/3276483). ACM New York, 2018, p. 113:1–113:27.

[\[project page\]](#) [\[preprint\]](#)

4. [Julia Belyakova](#). “Implementation of Certified Interpreter for an Extension of Simply Typed Lambda Calculus with Concept Parameters”, *Proceedings of “A. L. Fuksman Conference on Programming Languages and Compilers 2017”*, p. 53–58. Rostov-on-Don, Russia, Apr 3–5, 2017. [\[e-print \(in Russian\)\]](#)
5. [Julia Belyakova](#). “Language Support for Generic Programming in Object-Oriented Languages: Peculiarities, Drawbacks, Ways of Improvement”, *Lecture Notes in Computer Science. Programming Languages: 20th Brazilian Symposium, SBLP 2016*, ISBN 978-3-319-45279-1 (Online), DOI [10.1007/978-3-319-45279-1_1](https://doi.org/10.1007/978-3-319-45279-1_1), No 9889. Springer International Publishing, 2016, p. 1–15. [\[preprint\]](#)
6. [Julia Belyakova](#). “Language Support for Generic Programming in Object-Oriented Languages: Design Challenges”, *Proceedings of the Institute for System Programming*, ISSN 2220-6426 (Online), No 28(2). Moscow, Russia, 2016, p. 5–32. [\[e-print in ACM format\]](#) [\[e-print\]](#)
7. [Julia Belyakova](#), [Stanislav Mikhalkovich](#). “Pitfalls of C# Generics and Their Solution Using Concepts”, *Proceedings of the Institute for System Programming*, ISSN 2220-6426 (Online), No 27(3). Moscow, Russia, 2015, p. 29–45. [\[e-print in ACM format\]](#) [\[e-print\]](#)
8. [Michail Abramyan](#), [Julia Belyakova](#), [Stanislav Mikhalkovich](#). “Using of Web Development Environment PascalABC.NET for a Distance Learning of Programming”, *J. Distancionnoe I Virtualnoe Obuchenie [J. Distant and Virtual Learning]*, ISSN 1561-2449, No 57(3). Moscow, Russia, 2012, p. 14–24. [\[e-print \(in Russian\)\]](#)

OTHER ISSUES

1. [Stanislav Mikhalkovich](#), [Julia Belyakova](#). “Concept Parameters as a Mechanism of Development of the Language Support for Generic Programming in C#”, *J. Modern Information Technologies and IT in Education*, ISSN 2411-1473, No 11(2). Moscow, Russia, 2015, p. 205–213. [\[e-print \(in Russian\)\]](#)
2. [Julia Belyakova](#), [Stanislav Mikhalkovich](#). “Support for Generic Programming in the Modern Object-Oriented Languages. Part 2. A Review of the Modern Solutions”, *Transactions of Scientific School of I. B. Simonenko. Issue 2*, ISBN 978-5-9275-1607-0. Rostov-on-Don, Russia, 2015, p. 78–92. [\[e-print \(in Russian\)\]](#)
3. [Julia Belyakova](#), [Stanislav Mikhalkovich](#). “Support for Generic Programming in the Modern Object-Oriented Languages. Part 1. An Analysis of the Problems”, *Transactions of Scientific School of I. B. Simonenko. Issue 2*, ISBN 978-5-9275-1607-0. Rostov-on-Don, Russia, 2015, p. 63–77. [\[e-print \(in Russian\)\]](#)
4. [Stanislav Mikhalkovich](#), [Julia Belyakova](#). “Web Development Environment PascalABC.NET and Its Usage in Education”, *Transactions of Scientific School of I. B. Simonenko*. Rostov-on-Don, Russia, 2010, p. 172–178. [\[e-print \(in Russian\)\]](#)

PEER-REVIEWED WORKSHOP PUBLICATIONS

1. [Julia Belyakova](#). “Decidable Tag-Based Semantic Subtyping for Nominal Types, Tuples, and Unions”, *Proceedings of the 21st Workshop on Formal Techniques for*

Java-like Programs, DOI 10.1145/3340672.3341115, p. 3:1–3:11. London, United Kingdom, Jul 15, 2019. [project page] [preprint]

2. Julia Belyakova. “Generic Approach to Certified Static Checking of Module-like Constructs”, *Proceedings of the 19th Workshop on Formal Techniques for Java-like Programs*, DOI 10.1145/3103111.3104045, p. 5:1–5:2. Barcelona, Spain, Jun 2, 2017. [preprint]

OTHER CONFERENCE PROCEEDINGS

1. Julia Belyakova, Stanislav Mikhalkovich. “Requirements to Extending Support of Generic Programming in Existing Object-Oriented Languages”, *Proceedings of Scientific conference “Modern Information Technologies: Tendencies and Perspectives of Evolution”*, p. 65–68. Rostov-on-Don, Russia, 2016. [e-print (in Russian)]
2. Julia Belyakova, Artem Pelenitsyn. “Storage and Publication System for Texts of Assignments in Educational Environment Moodle”, *Proceedings of Scientific conference “Modern Information Technologies: Tendencies and Perspectives of Evolution”*, p. 61–63. Rostov-on-Don, Russia, 2015. [e-print (in Russian)]
3. Michail Abramyan, Julia Belyakova, Stanislav Mikhalkovich. “Multi-language web development environment PascalABC.NET and integration of electronic taskbook Programming Taskbook in it”, *Transactions of XIX All-Russian Scientific and Methodic Conference “Telematika‘2012”*, p. 288–289. Saint Petersburg, Russia, 2012. [scan (in Russian)]
4. Julia Belyakova, Stanislav Mikhalkovich. “First report on the service of distance education in Web development environment PascalABC.NET”, *Proceedings of Scientific conference “Modern Information Technologies in Education: Tendencies and Perspectives of Evolution”*, p. 42–43. Rostov-on-Don, Russia, 2012. [scan (in Russian)]
5. Julia Belyakova, Stanislav Mikhalkovich. “New functions of Web development environment PascalABC.NET: shared access to the files, graphic unit, increasing of stability”, *Proceedings of Scientific and Methodic Conference “Modern Information Technologies in Education: Southern Federal District”*, p. 48–49. Rostov-on-Don, Russia, 2011. [scan (in Russian)]
6. Julia Belyakova. “Web development environment PascalABC.NET”, *Proceedings of “Week of Science ‘2010”*, p. 86–89. Rostov-on-Don, Russia, 2011. [scan (in Russian)]
7. Stanislav Mikhalkovich, Julia Belyakova. “Graphic library for Web development environment PascalABC.NET”, *Proceedings of Selected Works of V International Scientific and Practical Conference “Modern Information Technologies and IT-Education”*, p. 422–428. Moscow, Russia, 2010. [scan (in Russian)]
8. Julia Belyakova, Stanislav Mikhalkovich. “Web development environment PascalABC.NET”, *Transactions of XIX All-Russian Scientific and Methodic Conference “Telematika ‘2010”, Students and Postgraduate Scientific Works Competition “Telematika‘2010: Telecommunications, Web-technologies, Supercomputing”*, p. 288–289. Saint Petersburg, Russia, 2010. [scan (in Russian)]
9. Julia Belyakova, Stanislav Mikhalkovich. “The First Report About Web Development Environment PascalABC.NET”, *Proceedings of Scientific and Methodic Conference “Modern Information Technologies in Education: Southern Federal District”*, p. 58–59. Rostov-on-Don, Russia, 2010. [scan (in Russian)]

TEACHING

KHOURY NEU

In 2020, I worked as a teaching assistant (TA) at the [Khoury College of Computer Sciences](#).

Software Development (undergraduate) Fall 2020
section head TA (code reviews, office hours, grading, meta grading) [\[coursepage\]](#)

Principles of Programming Languages (undergraduate) Spring 2020
TA (office hours, grading) (also gave a lecture on the Julia language) [\[coursepage\]](#)

MMCS SFEDU

In 2012–2016 I was teaching at the [I. I. Vorovich Institute for Mathematics, Mechanics and Computer Science](#).

Theory of Programming Languages (undergraduate) Spring 2016
Lectures, labs, seminars (it was a new course I designed from scratch)
[\[YouTube playlist of videos \(in Russian\)\]](#)

Introduction to the theory of programming languages: judgments, operational semantics, type systems, propositions as types. Programming assignments: interpreters, type checkers, and a simple compiler (all in Standard ML).

C++ Programming Language (undergraduate) Fall 2016
Labs

Design Patterns (undergraduate) 2014–2016
Labs, seminars (I designed all programming assignments)

Programming Languages (undergraduate) 2014–2016
Labs, seminars

Computer Architecture (undergraduate) 2014–2016
Labs

Introduction to Programming (undergraduate) 2012–2015
Labs, seminars (in 2014–2016, I redesigned some programming assignments)

NATURAL LANGUAGES

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|----------------|---|
| <i>Russian</i> | Native speaker |
| <i>English</i> | Advanced (CAE Certificate, Grade C [190/210], 2015) |
| <i>Spanish</i> | Beginner |

TECHNICAL SKILLS

PROGRAMMING LANGUAGES

Experienced with Julia, Coq, C#, \LaTeX , HTML, CSS

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| <i>Familiar with</i> | bash, Haskell, Python, x86 Assembly, SML |
| <i>Used in the past</i> | JavaScript, Java, C++, C, Pascal |
| <i>Shallowly familiar with</i> | Scala, Agda, Racket |

OPERATING SYSTEMS

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| <i>Comfortable with</i> | GNU/Linux |
| <i>Used in the past</i> | Windows, macOS |

ENVIRONMENTS

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| <i>Experienced with</i> | Git |
| <i>Familiar with</i> | Emacs, Make |

SERVICE

CONFERENCE ORGANIZATION

- Diversity Chair in Organizing Committee.
ECOOP 2020: European Conference on Programming Languages 2020 (Potsdam, Germany, Jul 2020).
- Co-Chair in Organizing Committee.
ECOOP DS 2019: Doctoral Symposium at the European Conference on Programming languages 2019 (London, United Kingdom, Jul 2019).
- Co-Chair in Organizing Committee.
ECOOP/ISSTA DS 2018: Doctoral Symposium at the European Conference on Object-Oriented Programming (Amsterdam, Netherlands, Jul 15, 2018).
- Organizing Committee Member, web-site co-master.
PLC-2017: A.L. Fuksman Conference on Programming Languages and Compilers (Rostov-on-Don, Russia, Apr 3–5, 2017).

PROGRAM COMMITTEES

- **ICCQ 2021**: International Conference on Code Quality 2021 (Moscow, Russia, Mar 27, 2021).
- **TyDe 2019**: Workshop on Type-Driven Development, collocated with ICFP 2019 (Berlin, Germany, Aug 18–23, 2019).
- **ECOOP DS 2017**: Doctoral Symposium at the European Conference on Object-Oriented Programming (Barcelona, Spain, Jun 18, 2017).

ARTIFACT EVALUATION COMMITTEES

- **CAV 2021**: Artifact Evaluation track at International Conference on Computer-Aided Verification 2021 (Los Angeles, California, USA).
- **PLDI 2020**: ACM SIGPLAN Conference on Programming Language Design and Implementation 2020 (London, United Kingdom, Jun 2020).
- **ECOOP 2019**: European Conference on Programming languages 2019 (London, United Kingdom, Jul 15–19, 2019).

MISCELLANEOUS

- Reading group co-organizer (Summer–Fall 2020).
[PRL](#): Programming Research Laboratory.
- [PL-junior](#) seminar co-organizer (Spring–Summer 2020).
[PRL](#): Programming Research Laboratory.
- Student Volunteer.
[ECOOP 2019](#): European Conference on Programming Languages (London, United Kingdom, Jul 15–19, 2019).
- Student Volunteer.
[SPLASH 2018](#): ACM SIGPLAN conference on Systems, Programming, Languages and Applications: Software for Humanity (Boston, MA, USA, Nov 4–9, 2018).
- Student Volunteer.
[ICFP 2018](#): ACM SIGPLAN International Conference on Functional Programming (St. Louis, Missouri, USA, Sep 23–29, 2018).
- [People page](#) and mailing list maintainer (Fall 2018–Fall 2020).
[PRL](#): Programming Research Laboratory.
- Student Volunteer.
[ECOOP/ISSTA 2018](#): European Conference on Object-Oriented Programming/International Symposium on Software Testing and Analysis (Amsterdam, Netherlands, Jul 15–21, 2018).
- Student Volunteer.
[ECOOP 2017](#): European Conference on Object-Oriented Programming (Barcelona, Spain, Jun 18–23, 2017).
- Student Volunteer.
[ECOOP 2016](#): European Conference on Object-Oriented Programming (Rome, Italy, Jul 17–22, 2016).

SELECTED TALKS

CONFERENCE/WORKSHOP PRESENTATIONS

1. [OOPSLA 2020](#) (Online), Session T6-B, Nov 17, 2020. “*World Age in Julia: Optimizing Method Dispatch in the Presence of Eval*”
[\[project page\]](#) [\[preprint\]](#) [\[slides\]](#) [\[video\]](#)
2. [IEEE Visualization Conference 2020](#) (Online) Short Papers, Session Systems/Libraries/Algorithms, Oct 28, 2020. “*Just TYPEical: Visualizing Common Function Type Signatures in R*”
[\[project page\]](#) [\[preprint\]](#) [\[video\]](#)
3. [Formal Techniques for Java-like Programs 2019](#) (London, United Kingdom), [ECOOP Series](#), Jul 15, 2019. “*Decidable Tag-Based Semantic Subtyping for Nominal Types, Tuples, and Unions*”
[\[preprint\]](#) [\[slides\]](#)
4. [Formal Techniques for Java-like Programs 2017](#) (Barcelona, Spain), [ECOOP Series](#), Jun 20, 2017. “*Generic Approach to Certified Static Checking of Module-like Constructs*”
[\[preprint\]](#) [\[slides\]](#)

5. [A. L. Fuksman Conference on Programming Languages and Compilers 2017](#) (Rostov-on-Don, Russia), Session 1-3, Apr 4, 2017. *“Implementation of Certified Interpreter for an Extension of Simply Typed Lambda Calculus with Concept Parameters”*
[e-print (in Russian)] [slides (in Russian)]
6. [XX Brazilian Symposium on Programming Languages 2016](#) (Maringa, Brazil), Session 5, Sep 23, 2016. *“Language Support for Generic Programming in Object-Oriented Languages: Peculiarities, Drawbacks, Ways of Improvement”*
[preprint] [slides]
7. [ECOOP 2016 Doctoral Symposium](#) (Rome, Italy), Session 2, Jul 17, 2016. *“Concept Parameters as a New Mechanism of Generic Programming for C# Language”*
[proposal] [slides]
8. [META 2016: Fifth International Valentin Turchin Workshop on Metacomputation](#) (Pereslavl-Zalessky, Russia), Session 3, Jun 28, 2016. *“Language Support for Generic Programming in Object-Oriented Languages: Design Challenges”* [e-print] [slides]
9. [SITO: Modern Information Technologies: Tendencies and Perspectives of Evolution 2016](#) (Rostov-on-Don, Russia), Innovative Research in Information technologies Section, Apr 21, 2016. *“Requirements to Extending Support of Generic Programming in Existing Object-Oriented Languages”* [slides (in Russian)]
10. [SYRCoSE: Spring/Summer Young Researchers Colloquium on Software Engineering 2015](#) (Samara, Russia), Programming Technologies Section, May 28, 2015. *“Pitfalls of C# Generics and Their Solution Using Concepts”*
[e-print in ACM format] [slides]

SEMINAR TALKS

1. [NEPLS 2017, Olsen Hall, UMass Lowell](#) (Lowell, MA, USA), [New England Programming Languages and Systems Symposium Series](#), Jun 2, 2017. *“Generic Coq Library for Certified Static Checking of Module-like Language Constructs”* [slides]
2. [College of Computer and Information Science, Northeastern University](#) (Boston, MA, USA), [Programming Language Seminar](#), Feb 3, 2017. *“Comparative Study of Generic Programming Features in Object-Oriented Languages”* [slides]
3. [JetBrains Research](#) (Saint Petersburg, Russia), [Seminar of Programming Languages and Tools Lab](#), Oct 24, 2016. *“Generic Programming Approaches and Tools in Object-Oriented Languages: Peculiarities, Drawbacks, Alternatives”*
[slides (in Russian)]
4. [Oregon Programming Languages Summer School \(OPLSS\) 2015](#) (University of Oregon, Eugene, Oregon, USA), [Participant Talks](#), 23.06.2015. *“Pitfalls of C# Generics: How Can We Do Better?”* [slides]
5. [Institute for System Programming of the Russian Academy of Sciences](#) (Moscow, Russia), [System Programming Department seminar](#), 21.01.2015. *“Motivation and design of Concepts with subtype constraints for C# language”* [slides (in Russian)]
6. [I. I. Vorovich Institute of Mathematics, Mechanics and Computer Science](#) (Rostov-on-Don, Russia), [Foundations of Programming Languages seminar](#), 01.04.2013. *“Praconcepts: long path from birth to new birth, part I”* [slides (in Russian)]

7. I. I. Vorovich Institute of Mathematics, Mechanics and Computer Science (Rostov-on-Don, Russia), Foundations of Programming Languages seminar, 22.04.2013. “*Praconcepts: long path from birth to new birth, part II*” [slides (in Russian)]

SUMMER SCHOOLS AND OTHER TRAININGS

ECOOP 2017 Summer School (ESS 2017), co-located with the 31st European Conference on Object-Oriented Programming 2016
Barcelona, Spain

ECOOP 2016 Summer School (ESS 2016), co-located with the 30th European Conference on Object-Oriented Programming 2016
Rome, Italy

Programming Languages Mentoring Workshop (PLMW) 2016, co-located with 43rd Symposium on Principles of Programming Languages 2016
St. Petersburg, Florida, USA

Oregon Programming Languages Summer School 2015 “Types, Logic, Semantics, and Verification” 2015
University of Oregon, Eugene, Oregon, USA

Summer School Marktoberdorf 2014 “Dependable Software Systems Engineering” 2014
Marktoberdorf, Germany [Certification of Participation]

AWARDS

Letter of Gratitude for the Talk 2014
Southern Federal University [Letter scan (in Russian)]
Student Session during Annual “Week of Science”. Title: “Extended Constraints on .NET Generics Type Parameters” [slides (in Russian)]

Diploma for Study and Research Achievements 2011
Southern Federal University [Diploma scan (in Russian)]

Participation in the Final Stage of All-Russian Student Researches Competition “Telematics ‘2010: Telecommunications, Web-Technologies and Supercomputing” 2010
University of Information Technologies, Mechanics and Optics
Saint Petersburg, Russia [Certificate scan (in Russian)]
Project “Web Development Environment PascalABC.NET”

Diploma of the American Charitable Foundation “Information Technology” for the Participation in “Telematics ‘2010” Student Competition 2010
[Diploma scan (in Russian)]
Diploma for the participation in the Final Stage of All-Russian Student Researches Competition “Telematics ‘2010: Telecommunications, Web-Technologies and Supercomputing”

Diploma for the Best Talk 2010
Southern Federal University [Diploma scan (in Russian)]

Student Session during Annual “Week of Science”. Title: “Web Environment for Programming PascalABC.NET” [[slides \(in Russian\)](#)]

SCHOLARSHIPS

Academic Mobility Stimulation Scholarship 2015
Southern Federal University, Rostov-on-Don, Russia

Increased State Academic Scholarship Feb 2014–June 2014
Southern Federal University, Rostov-on-Don, Russia

President’s Scholarship Sep 2011–June 2012
Southern Federal University, Rostov-on-Don, Russia [[Annex to the Order \(in Russian\)](#)]

Governor’s Scholarship Feb 2011–June 2011
Southern Federal University, Rostov-on-Don, Russia